

Response to Claim Rejections

US Patent No. 2,940,921 fails to teach the current invention

Applicant respectfully submits that claims 1, 3-6, 9, 11, 12, 17, 18, 19, 23, and 24 are not obvious over U.S. Patent No. 2,940,921 (Malloy). Applicant respectfully submits that the claims contain material elements that are missing in the Malloy patent and that it would not be obvious to add or alter the elements of Malloy to create a more efficient process of the current invention.

First Argument

The Examiner argues that the present invention does not disclose where the aromatics are removed and the paraffins are further addressed. Applicant respectfully submits that after the first reactor, which is run at temperatures below cracking, Malloy fractionates the products and removes the C5 and C6 paraffins which have been isomerized (Malloy, Col 1, 1.59-60). These paraffins are removed from the fractionator 25 through line 29 and sent directly to the reformat pool without any further reactor processing and the remaining components, including any aromatics, are passed through line 27 for further processing. The amended claims of the current invention instead specifies that a substantial portion of the aromatic in the first reactor effluent stream is collected in the reformat pool. The current invention, as shown in claims 1 and 19 as well as the claims that depend therefrom, converts paraffins to aromatics and then removes an aromatic product.

Malloy teaches isomerization of C5 and C6 components to increase octane rating. Malloy teaches the isolation of the isomerized C5 and C6 into the reformat pool. In contrast, the

current claims teach the formation of aromatic compounds, such as benzene, toluene and xylene. The current invention teaches cooling the effluent stream removed from the reactor to remove a substantial portion of the aromatics produced in the reaction thereby decreasing the concentration of aromatics in the feed to the next reaction section. This causes the chemical equilibrium in the downstream reactors to shift in favor of producing additional aromatic compounds. This is directly contrary to the teaching of Malloy who teaches isomerization of C5 and C6 components as opposed to formation of aromatics.

Second Argument

Applicant has amended Claims 1 and 19 to clarify that the invention includes combining and cooling the first and second liquid streams and sending the first and second liquid streams directly to a reformat pool, as opposed to sending the stream through additional reaction steps or other steps that change the composition of the stream. The combined first liquid stream and second liquid stream undergoes no additional reactors or equilibrium separators that would modify the composition of the stream (Specification, paras [0013] and [0014]).

As noted in previous correspondence, the examiner points out that, the C7+ fractions of Malloy are combined and ultimately arrive at a reformat pool, however this is only after the C7+ is combined with the C4- fraction and has undergone significant treatment (see col. 2 line 61 – col. 3 line 17). In contrast, as discussed above, amended claim 1 and 19 of the current application claims that the first liquid stream and second liquid stream are combined then cooled and immediately sent to a reformat pool. By removing the liquid, the product sent to the next reactor in the current application will have a lower concentration of both aromatics and of the naphthenes that were converted to aromatics. This changes the equilibrium of the product

entering the reactor and enhances the driving force for the formation of aromatics. In addition, because most, if not all, of the naphthenes have been depleted in the first reactor, the remaining processes can be more specifically tailored to converting the more difficult paraffins.

Therefore, the current invention addresses the problem encountered using the Malloy method, namely the need for conversion of additional undesirable components into valuable products. Malloy patent fails to teach the improved method of the current independent claims 1 and 19. Naphtha reforming produces high octane gasoline and aromatics in the petrochemical industry. The amount of benzene in aromatics as gasoline is carefully controlled in the world. Therefore, improvements in efficiency in this process can translate to substantial economic incentives. The current invention addresses a long felt need to create a higher quality product efficiently.

The Federal Circuit noted in *In re Fritch* that:

Under Section 103, teachings of references can be combined *only* if there is some suggestion or incentive to do so. Although couched in terms of combining teachings found in the prior art, the same inquiry must be carried out in the context of a purported obvious "modification" of the prior art. The mere fact that the prior art may be modified in the manner suggested by the Examiner does not make the modification obvious unless the prior art suggested the desirability of the modification. (emphasis original) 23 U.S.P.Q. 2d 1780, 1784 (Fed. Cir. 1992).

Malloy does not suggest any motivation or desire to modify the elements to accomplish Applicant's present invention. On the contrary, Malloy teaches away from the current invention by separating the paraffins to avoid processing them thereby losing valuable hydrocarbon material and creating a waste product. The invention as claimed in independent claims 1 and 19 and the claims that depend therefrom are thus nonobvious.

Third Argument

Applicant respectfully submits that Rambo is non-analogous art in that it is a gas separation plant. "In order to rely on a reference as a basis for rejection of an applicant's invention, the reference must either be in the field of applicant's endeavor or, if not, then be reasonably pertinent to the particular problem with which the inventor was concerned." MPEP § 2141.01(a). Rambo is disparate art in a different class of invention. Rambo does not have any reaction processes but instead simply separates the components of a gas stream by equilibrium separation. The art of separation through the use of a demethanizer or a deethanizer is not reasonably pertinent to the art of reforming straight chain alkanes into reformed molecules. One of ordinary skill in the art would not look to the field of gas separation when addressing a need in naphtha reforming.

Furthermore, the addition of elements from Rambo to Malloy would not create the current invention as claimed. Malloy removed the isomerized C6 fraction. By removing this fraction, the driving force to convert cyclohexane to benzene is significantly reduced, thereby teaching away from the current invention which increases the amount of aromatics produced. Furthermore, Malloy not only reduces the formation of aromatics in this manner, but by maintaining the amount of benzene available in the feed to the next reactor stage (as opposed to removing it to a reformat pool), Malloy further shifts the chemical equilibrium away from producing more aromatics. One of ordinary skill in the art would understand that Malloy may result in some conversion of benzene (or other aromatics) back into cyclohexane, given that Malloy does not teach the benefits of aromatics in increasing octane but is focused on isomerization. Therefore, even if the elements of Rambo are combined with Malloy, this does not teach the invention as currently claimed.

Fourth Argument

Applicant has amended claims 10 and 21 to clarify that the hydrocarbon feed stream is split, as opposed to undergoing an equilibrium separation process, to create a second hydrocarbon feed stream. Separation involves separating various components of the feed to create two streams of differing composition. Splitting is the process whereby the two resulting streams have the same composition as the feed stream. Thus in the present invention the hydrocarbon stream is split (prior to any separation) while in Malloy, naphtha feed 2 is separated into two streams of differing composition, a light stream 6 and a heavy stream 8.

In commenting upon the references and in order to facilitate a better understanding of the differences that are expressed in the claims, certain details of distinction between the references and the present invention have been mentioned, even though such differences do not appear in all of the claims. It is not intended by mentioning any such unclaimed distinctions to create any implied limitations in the claims. Not all of the distinctions between the prior art and Applicant's present invention have been made by Applicant. For the foregoing reasons, Applicant reserves the right to submit additional evidence showing the distinctions between Applicant's invention to be unobvious in view of the prior art.

The foregoing remarks are intended to assist the Examiner in re-examining the application and in the course of explanation may employ shortened or more specific or variant descriptions of some of the claim language. Such descriptions are not intended to limit the scope of the claims; the actual claim language should be considered in each case. Furthermore, the remarks are not to be considered to be exhaustive of the facets of the invention, which render it patentable, being only

examples of certain advantageous features and differences that Applicant's attorney chooses to mention at this time.

Reconsideration of the application and allowance of all of the claims are respectfully requested. In view of the foregoing Response, Applicant respectfully submits that all of the claims are allowable, and Applicant respectfully requests the issuance of a Notice of Allowance. Should further discussion regarding the application be desired by the Examiner, a telephone conference is respectfully requested. I can be reached at (713) 221-3306.

In the event the fee is deemed insufficient, the Commissioner is authorized to charge
BRACEWELL & GIULIANI LLP, Deposit Account 50-0259 (4159.3005/SA 502) in the amount
of any deficiency.

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Respectfully submitted,



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